GATES LEARJET CORPORATION

maintenance manual

CHAPTER

53

FUSELAGE

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GENERAL - DESCRIPTION AND OPERATION

1. General

A. The fuselage is of semimonocoque construction consisting of stressed skin structure with transverse frames and longerons. Special attention has been paid to both fail-safe capabilities and long fatigue life airframe.

B. The "Area Rule" type fuselage is comprised of four basic sections. The nose section extends from the radome aft to frame 5. The pressurized section extends from frame 5 to frame 22 on 25B/D aircraft and from frame 5 to frame 18 on 25C/F aircraft. The fuel section extends from frame 22 to frame 24 on 25B/D aircraft and from frame 18 to frame 24 on 25C/F aircraft. The tailcone section extends from frame 24 aft to the stinger.

C. The area between frames 5 and 22 (25B/D aircraft) and frames 5 and 18 (25C/F aircraft) is pressurized and houses the crew, passenger, and baggage areas. Drilling, modification, or any type of work which creates a break in the pressure area is the responsibility of the owner or facility performing the work. Obtaining approval of the work is, therefore, their responsibility.

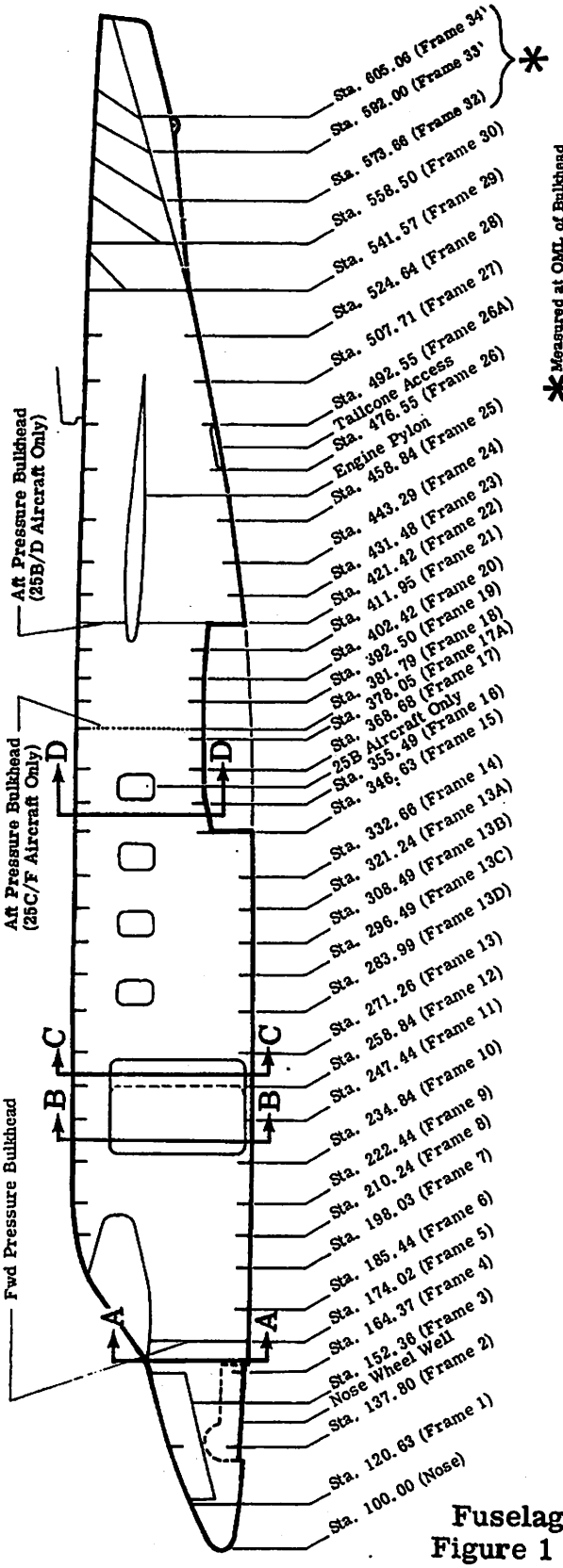
D. A two-piece passenger/crew door is located on the fuselage left side aft of frame 10. The fuselage incorporates plexiglass windows in the cabin area. The right rear window is contained within the emergency escape door.

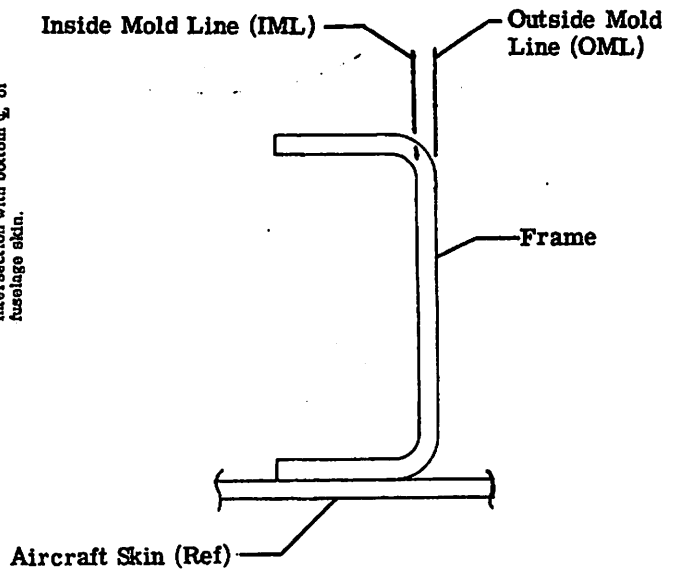
MAIN FRAME - DESCRIPTION AND OPERATION

1. General
 A. The fuselage main frame is constructed of frames, stringers, keel beam, longerons, a forward and aft pressure bulkhead and frames around openings. Refer to Figure 1.
 B. Located between fuselage stations 120.63 and 613.24 are 41 transverse frames spaced approximately 3.5 to 17 inches apart. The tailcone contains 5 canted frames for attachment of the vertical stabilizer. Cutouts are located around the perimeter of the frames for stringer clearance. Frames 16 thru 21 terminate when the lower end meets a longeron where the wing passes through the fuselage. Frames 6 thru 8 terminate where they meet the windshield. Frame 11 terminates where it meets the passenger/crew door. Frame 3 terminates where it meets the nose compartment access door opening and the nose wheel well. Frames 2 and 4 terminate where they meet the nose wheel well.
 C. Longitudinal stringers are located around the perimeter of the frames. A total of 41 stringers are spaced approximately 5 inches apart. The stringers are aluminum extrusions cut to various lengths.
 D. The keel beam extends from frame 5 to frame 15 down the bottom center of the fuselage. The keel consists of two longitudinal webs extending up at RBL and LBL 6.10. The webs are attached to the fuselage skin with angles and are capped by the inboard seat rails and tee extrusions. The seat rail extends from frame 10 to frame 15 on the right side. The left inboard seat rail extends from frame 12 to frame 15 on aircraft with 24 inch wide passenger/crew door and from frame 13 to frame 15 on aircraft with 36 inch wide passenger/crew door. Tee extrusions cap the webs forward of the seat rails. Fuselage frames are interrupted at the keel and are continued through the keel by webs. The floorboards are secured on top of the keel and become part of the aircraft structure.
 E. A longeron extends longitudinally down each side of the fuselage at the point where the fuselage and wing intersect. The longeron extends from frame 13B to frame 22.
 F. Two pressure bulkheads are installed in the aircraft, one at frame 5 and one at frame 22 on 25B/D aircraft and frame 5 and frame 18 on 25C/F aircraft.

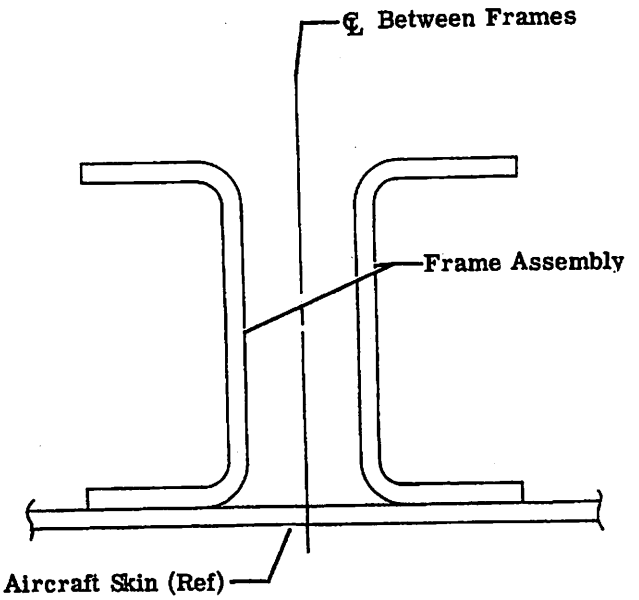
2. Description
 A. The station numbers, which are listed with the frame numbers, are measured at three basic points. Station numbers for frames 21 and forward are measured at the IML (inside mold line) of the frame. Station numbers for frames 22 and aft are measured at the OML (outside mold line) of the frame. Refer to Detail A, Figure 1.

B. Exceptions to this method of locating station numbers are frames 16, 18, 20, 21, 24 and 25. These particular frames are made up of double frames and the base for locating the station numbers is the centerline between these frames. Refer to Detail B, Figure 1.
 (1) Frame 16 station number is located .493 inch forward of the centerline between frames.
 (2) Frame 18 station number is located on the centerline between frames.
 (3) Frame 20 station number is located .236 inch forward of the centerline between frames.
 (4) Frame 21 station number is located .91 inch aft of the centerline between frames.
 (5) Frame 24 station number is located on the centerline between frames.
 (6) Frame 25 station number is located on the centerline between frames.



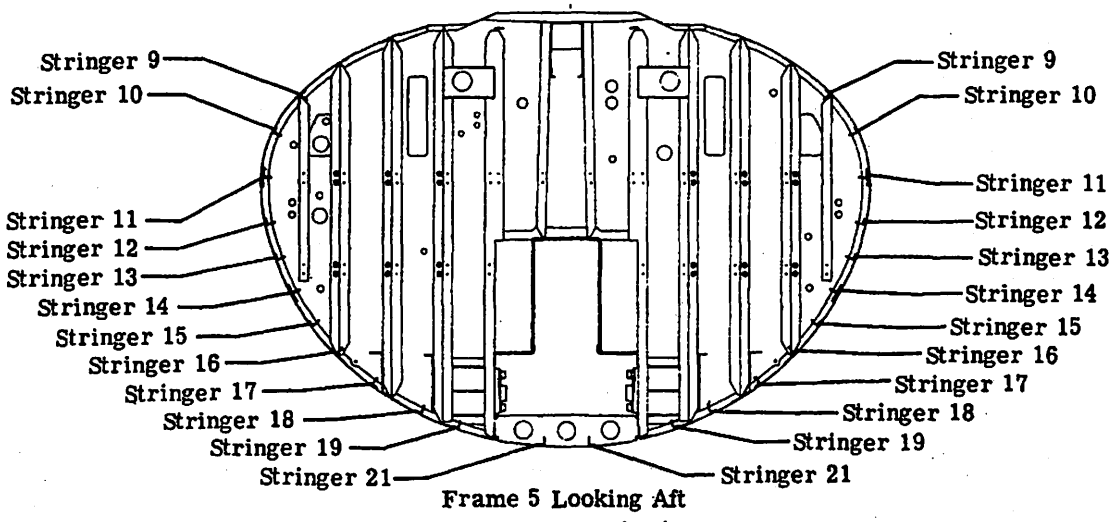


Detail A

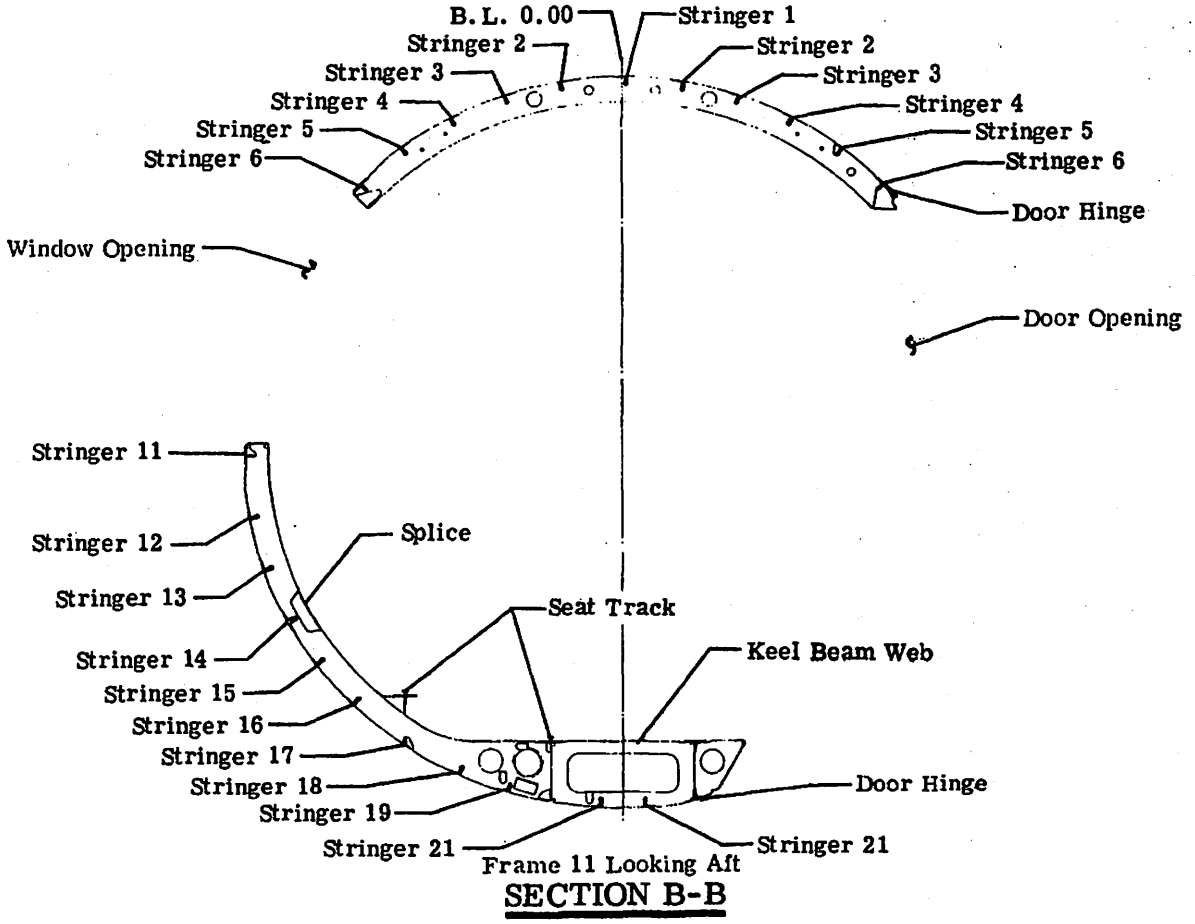


Detail B

Fuselage Assembly
Figure 1 (Sheet 1 of 3)

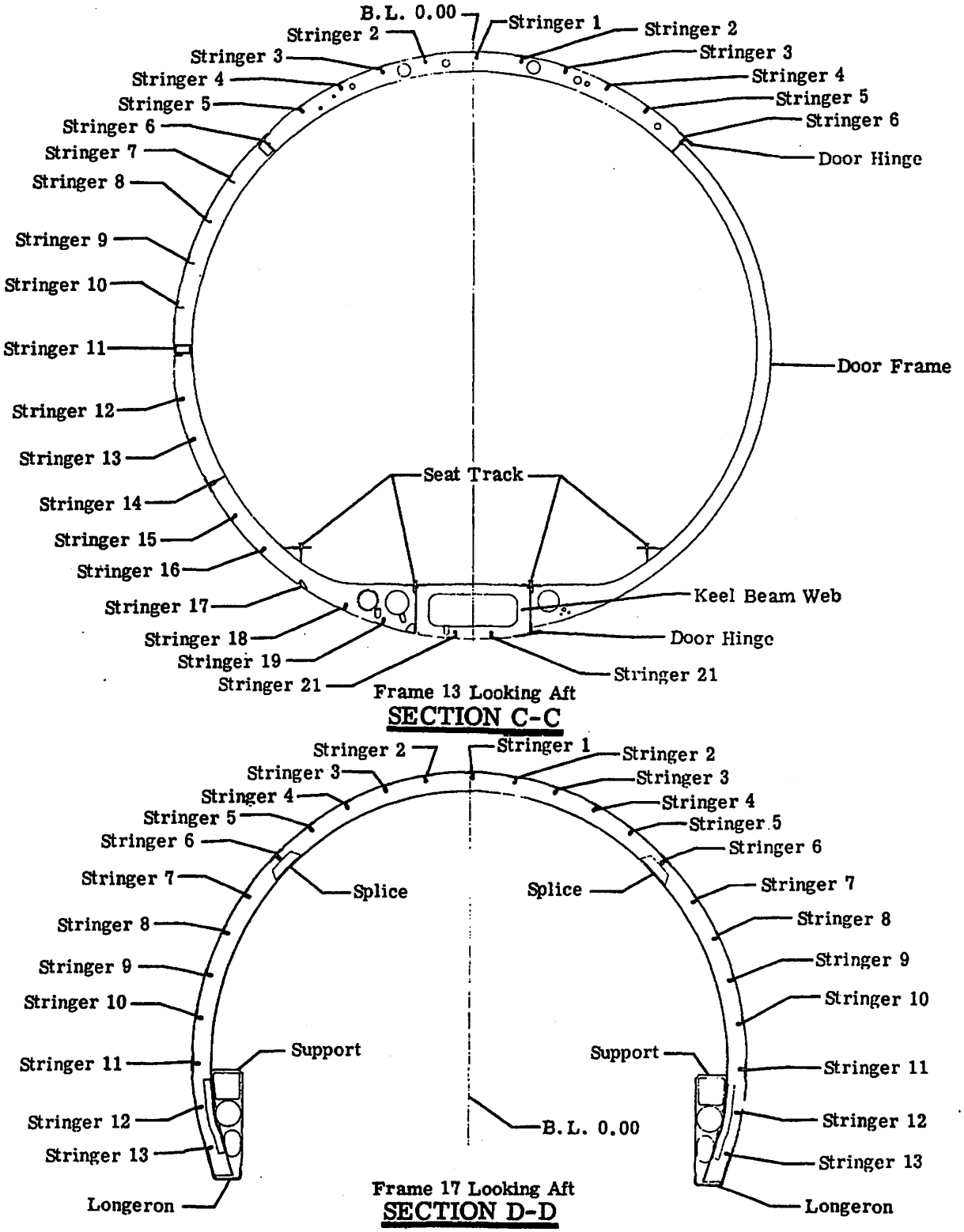


SECTION A-A



SECTION B-B

Fuselage Assembly
Figure 1 (Sheet 2 of 3)



Fuselage Assembly
Figure 1 (Sheet 3 of 3)

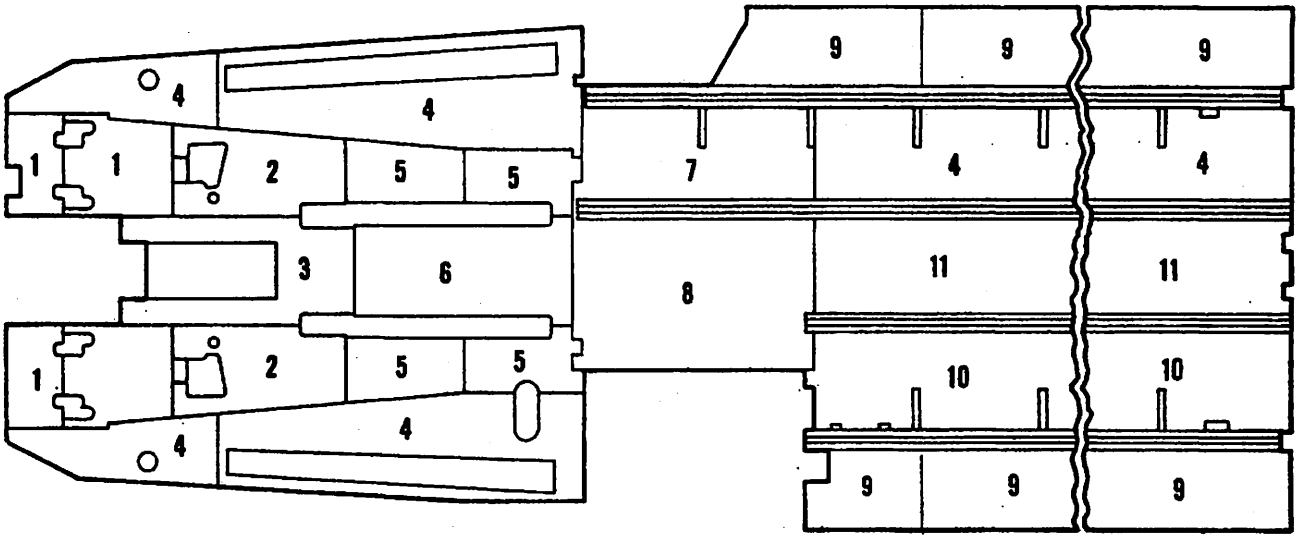
AUXILIARY STRUCTURE - DESCRIPTION AND OPERATION

1. General
 A. The auxiliary structure consists of the floorboards and pedestal structure.
 B. Removing various floorboards provides access to controls, hydraulic lines, air ducts, and electrical equipment and wiring. The floorboards are secured to the keel beam, frames, and support angles, and become part of the aircraft structure. Since the floorboards form part of the aircraft structure, the aircraft must not be flown without the floorboards installed.
 C. Panels in the pedestal provide access to equipment and controls in and below the pedestal.

2. Cabin Area Cargo Loading
 A. Proper cargo loading is very essential and the following parameters are to be strictly adhered to, as improper loading can result in aircraft damage.
 (1) Cabin loading in excess of 50 lb ft^2 should utilize a palletized arrangement to distribute the vertical loads to the seat rails.
 (2) The divan seat floor and baggage floor which are pressure loaded can sustain a 1.0 g load of 125 to 150 lb ft^2 loading in combination with the required cabin pressure loads.
 (3) Seat rails are used in many installations to secure cargo loading for various load directions. Appropriate seat rail allowables are indicated in the loading chart below.

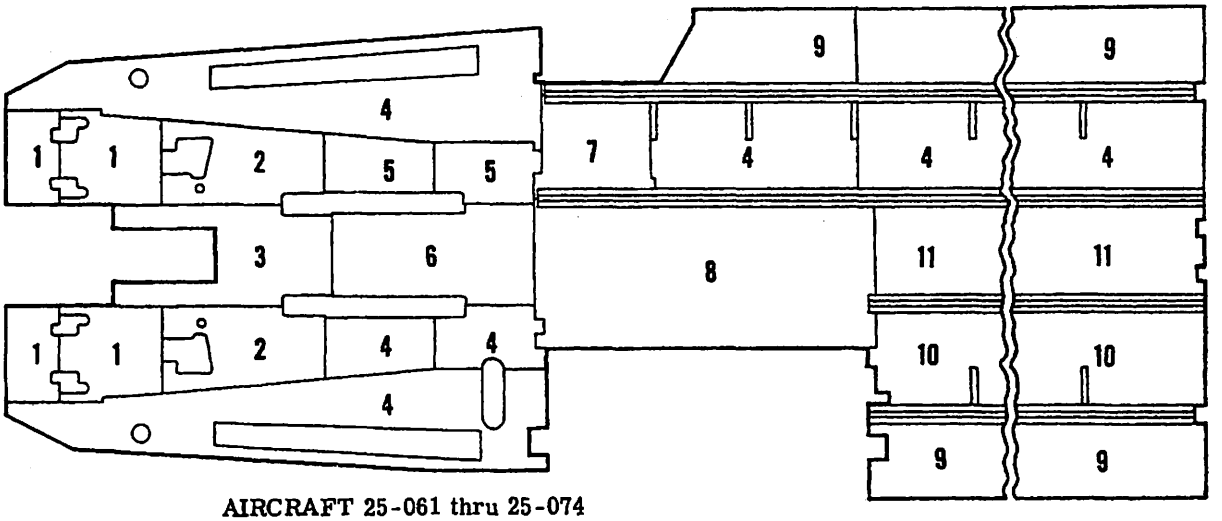
LOADING CHART	
Load Direction	Ultimate Load
Vertical	±4500 lb
Longitudinal	±3000 lb
Lateral	±1500 lb

 (4) Adequate restraints in all directions should be achievable with the cargo system and, typically, the 9.0 g forward load capacity is the most difficult. Adequate access to the RH escape hatch should be maintained unless the optional crew hatch is installed.

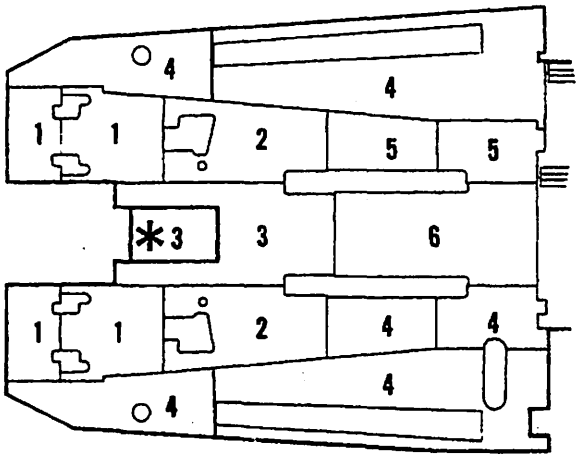


1. Brake Valve and Rudder Pedal Linkage
2. Control Cables, Pulleys and Hydraulic Lines
3. Control Sector
4. Hydraulic Lines and Air Ducts
5. Brake System Shuttle Valves and Hydraulic Lines
6. Control Cable, Pulleys and Roll Servo
7. Parking Brake Valves and Hydraulic Lines
8. Control Cables, Pulleys and Aileron-Rudder Interconnect.
9. Cabin Air Distribution Ducts
10. Hydraulic Lines, Emergency Air Lines
11. Control Cables, Pulleys and Anti-Collision Beacon

Floorboards
Figure 1 (Sheet 1 of 2)



AIRCRAFT 25-061 thru 25-074



AIRCRAFT 25-075 AND SUBSEQUENT
*AIRCRAFT 25-105 AND SUBSEQUENT

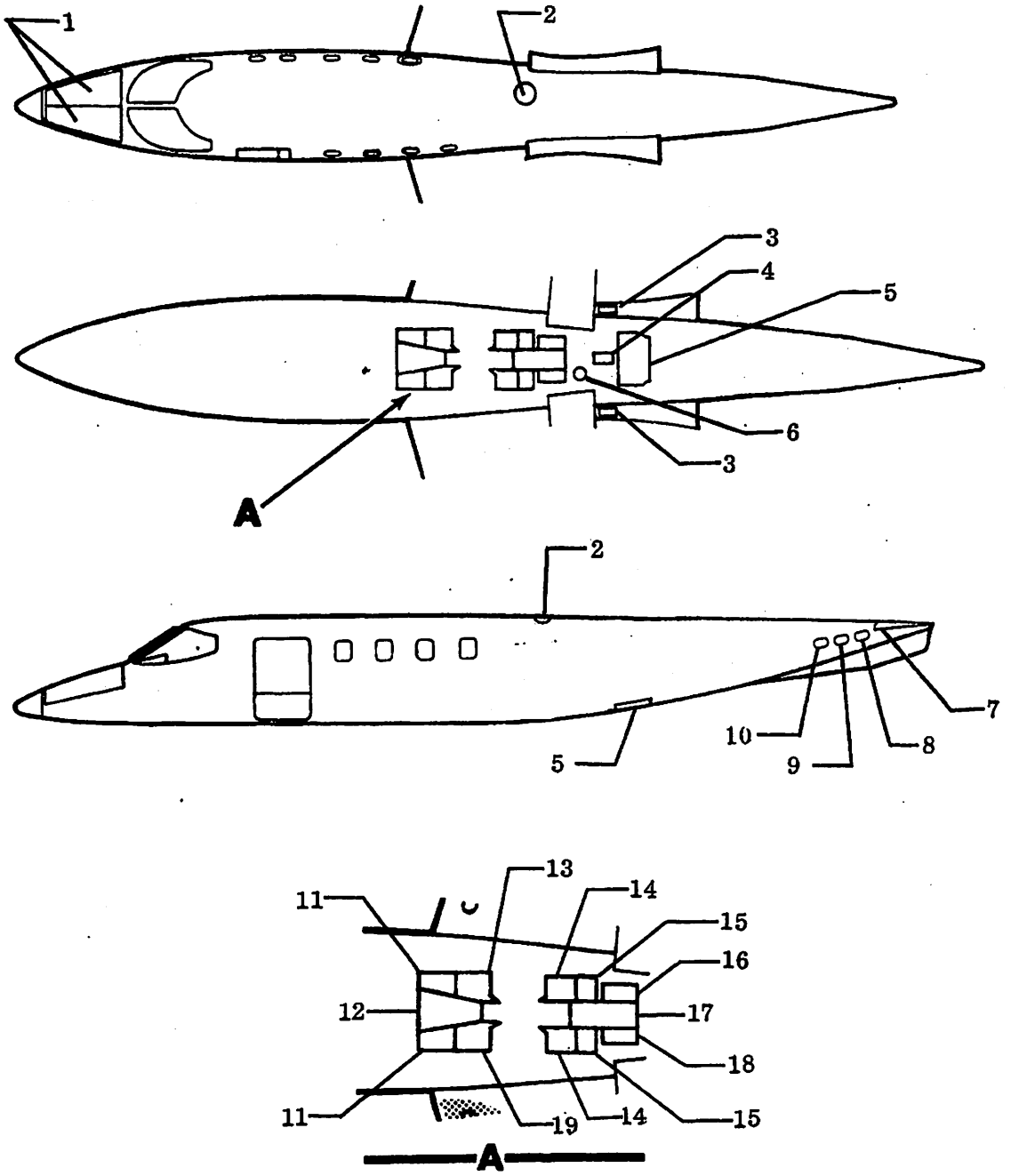
TYPICAL

1. Brake Valve and Rudder Pedal Linkage
2. Control Cables, Pulleys and Hydraulic Lines
3. Control Sector
4. Hydraulic Lines and Air Ducts
5. Brake System Shuttle Valves and Hydraulic Lines
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10. Hydraulic Lines, Emergency Air Lines
11. Control Cables, Pulleys and Anti-Collision Beacon

Floorboards
Figure 1 (Sheet 2 of 2)

PLATES/SKIN - DESCRIPTION AND OPERATION

1. General
 A. The fuselage frame is covered with aluminum skin permanently fastened to the frames and stringers.
 B. Access covers are located in the fuselage exterior to provide for inspection and as an aid in removal and installation of various components of the aircraft.
 C. The nose compartment access doors provide access to the equipment in the nose compartment and the forward side of frame 5 pressure bulkhead.
 D. A hinged tailcone access door provides access to electrical, hydraulic, fuel, fire extinguishing and airconditioning system and their related components.
 E. An access cover, located on top of the fuselage, is provided for removal and installation of the fuselage fuel tank probe.
 F. Access covers are located on the bottom of the fuselage where the wing passes through the fuselage. These access covers provide access to cables, drain valves, hydraulic lines, fuel plumbing and components, fuel vent plumbing and pneumatic plumbing.
 G. When installing an access cover assure that it is replaced in the same location from which removed and that it is clocked the same as it was prior to removal.



Fuselage Access Covers
Figure 1 (Sheet 1 of 2)

1. Electronic Equipment, Air Bottle and Anti-Ice Tank
2. Fuselage Tank Fuel Probe
3. Pylon Access
4. Fuel Vent Valves
5. Batteries, Electrical Components, Fuel Filters, Refrigeration Equipment, Hydraulic Components and Secondary Yaw Servo
6. Fuselage Tank Fuel Probe (Lower Fitting).
7. Rudder Bellcrank, Primary Yaw Servo Sector, Bottom Rudder Hinge Point, Servo Sector Cables, Rudder Cables, and Secondary Yaw Followup
8. Rudder Control Cables
9. Elevator Sector, Push-Pull Tubes, Autopilot Pitch Followup, Elevator, and Rudder Control Cables.
10. Rudder and Elevator Cables.
11. Hydraulic Lines
12. Rudder and Elevator Cable Turnbuckles and Sump Drain Valve
13. Fuel Crossflow Shutoff Valve, Hydraulic Lines, Pneumatic Lines, Jet Pump, Fuel Check Valve anf Fuel Drain Valve
14. Fuel Lines and on 25C/F Aircraft - Transfer Valve
15. Fuel and Hydraulic Lines, Aileron Cable Turnbuckles, Wing Fuel Pressure Switch and on 25B/D Aircraft - Fuel Shutoff Valve
16. Fuel Pump and Fuel Drain Valve
17. Fuel Lines, Fuel Tank Drain Valve, Elevator, Aileron and Rudder Cables, and Aileron Sector
18. Fuel Drain Valves
19. Fuel Plumbing, Hydraulic Lines, Wing Tank Drain Valve, and Defuel Valve

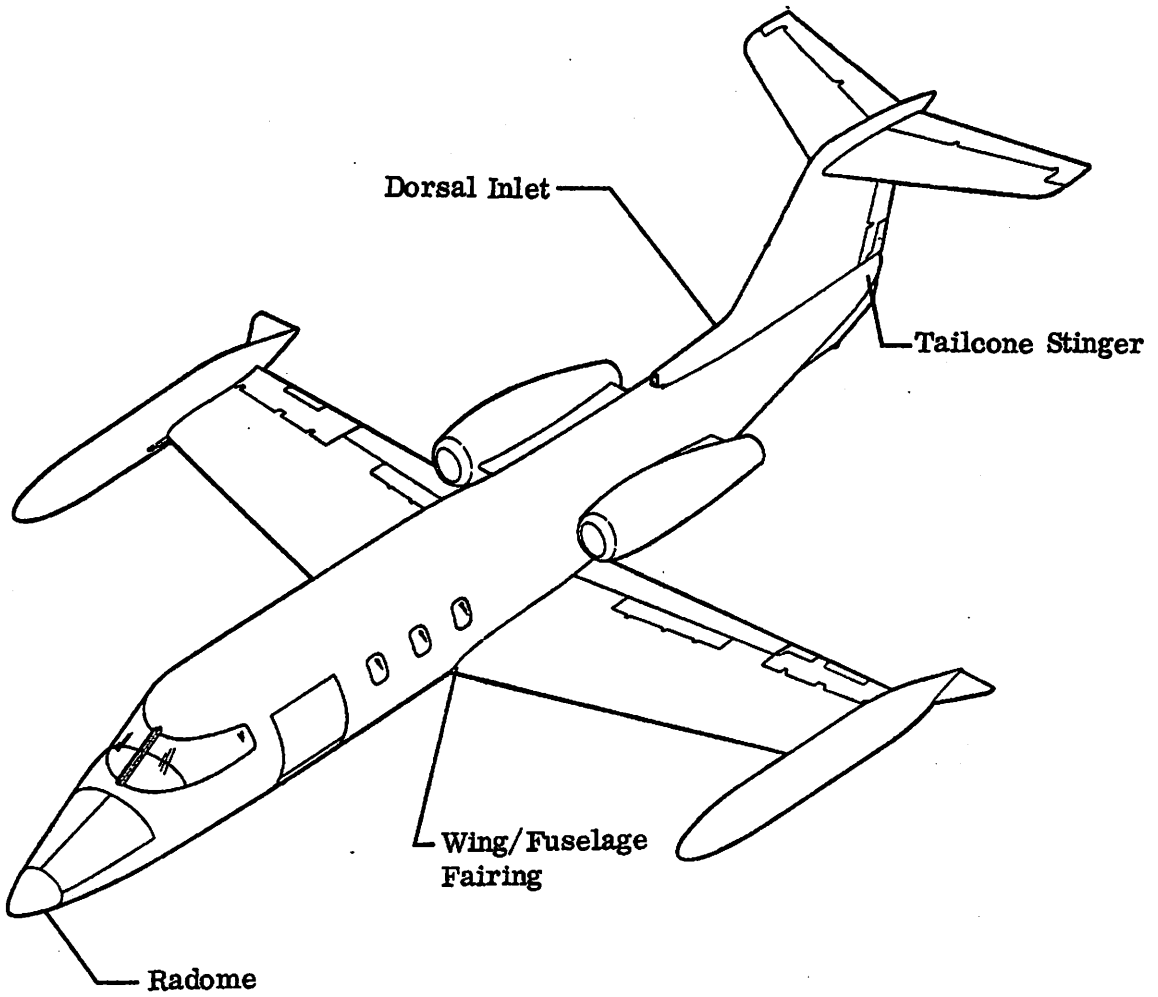
Fuselage Access Covers
Figure 1 (Sheet 2 of 2)

ATTACH FITTINGS - DESCRIPTION AND OPERATION

1. General
 A. Fittings are provided on the fuselage for attachment of the doors, wing, nose gear, seats, engines and the vertical stabilizer.
 B. The passenger crew doors are attached to the fuselage by piano-type hinges at the top and bottom of the door openings.
 C. The nose gear is attached to the fuselage by two trunnion pin bearing plates in the nose wheel well. The nose gear actuator is attached to the upper forward side of frame 5.
 D. The wing is attached to the fuselage at eight points (four on each side). The attach fittings extend from the longeron at the end of frames 16, 18, 20 and 21. Bolts secure the wing to the fuselage.
 E. The passenger and crew seats are secured to the floor by seat tracks. Notches in the tracks provide easy removal of the seats. The seat tracks are secured to the fuselage structure by screws.
 F. Engine beams extend through the fuselage at frames 24 and 25. The beams are constructed of channels and webs with engine attach fittings on the end. The pylon main frame, constructed of angles, bulkheads, ribs and stiffeners, forms an aerodynamic fairing enclosing the forward and aft engine beams where they extend from the fuselage.
 G. The vertical stabilizer is attached to the fuselage tailcone section at five major points. Five canted bulkheads in the tailcone match the five spars in the vertical stabilizer. The spars are bolted to the bulkheads.

AERODYNAMIC FAIRINGS - DESCRIPTION AND OPERATION

1. Description
 - A. Fuselage aerodynamic fairings include the wing/fuselage fairing, radome, dorsal inlet, and the tailcone stinger.
 - B. The wing/fuselage fairings are installed where the wing passes through the fuselage. The wing leading edge is also faired to the fuselage. The wing/fuselage fairing is removable for access to the wing attach fittings.
 - C. The radome is constructed of a single sandwich honeycomb core in the area which is penetrated by radar. The radome is attached to the nose cone by screws. An erosion boot is bonded to the radome to prevent environmental erosion.
 - D. The dorsal inlet fairs the vertical stabilizer to the fuselage and permits entry of ram air for the heat exchanger. The dorsal inlet is constructed of 5-ply laminated fiberglass and is attached permanently to the fuselage and vertical stabilizer. Two bulkheads are riveted into the dorsal inlet and are secured to the fuselage with screws.
 - E. The tailcone stinger is located at the aft-most portion of the fuselage tailcone. An access cover is located on the upper side of the stinger. A removable cap is installed on the aft-most portion of the stinger and ventral fin.



Fuselage Aerodynamic Fairings
Figure 1

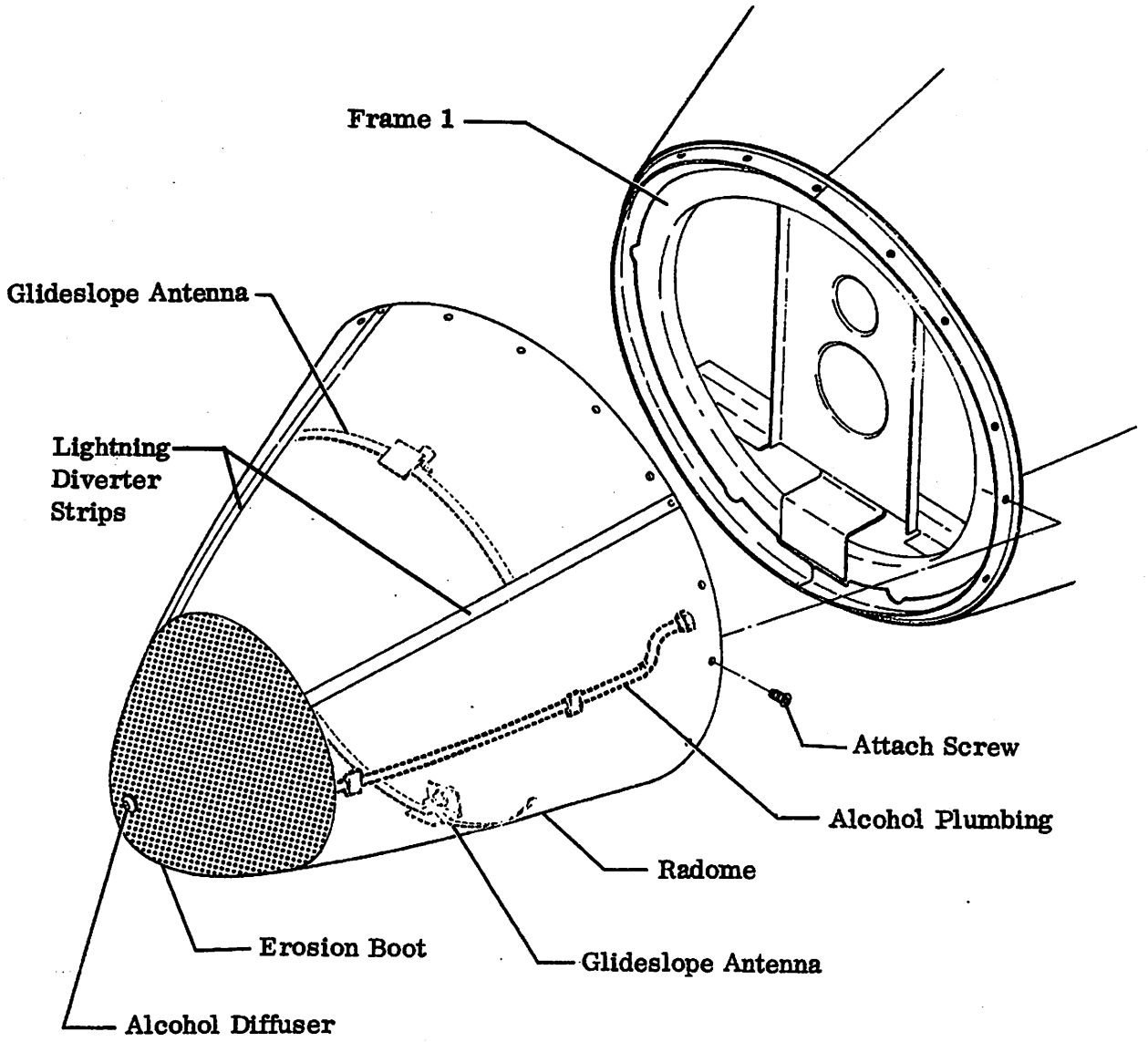
RADOME - MAINTENANCE PRACTICES

1. Removal/Installation

NOTE: The following maintenance practices do not include the installation of a new radome since it requires locating and fitting of the radome to the fuselage. If a new radome is to be installed, install in accordance with Special Spares Kit No. SSK 911.

A. Remove Radome (See figure 201)
 (1) Remove nose compartment access doors.
 (2) Disconnect primary and secondary glideslope antenna coax leads by reaching into radome through frame 1.
 (3) Remove radome attach screws and move radome forward far enough to disconnect alcohol plumbing at frame 1.
 (4) Remove radome from aircraft.

B. Install Radome (See figure 201).
 (1) Position radome close enough to frame 1 to allow connection of alcohol plumbing.
 (2) After connecting alcohol plumbing, position radome on frame 1 and secure with attach screws. Touch up painted areas as required.
 (3) Connect primary and secondary glideslope antenna coax leads.
 (4) Install nose compartment access doors.



Radome Installation
Figure 201

RADOME - APPROVED REPAIRS

1. Approved Repairs

NOTE:
- Approved repairs for the radome include the repair of minor damage to the radome skin.
- As a general rule, minor damage is defined as damage to the radome skin only. This excludes any damage which goes into or beyond the core.
- Radomes which cannot be repaired per the following instructions must either be replaced with a new radome per SSK 911 or returned to Gates Learjet Factory, attention Warranty Department, for repair. This includes any radome damaged beyond the limits set in the following instructions.

A. Tools and Equipment.

NAME	PART NUMBER	MANUFACTURER
Polyester Resin 6% Cobalt Napthenate	Hetron 92 Fed Spec. TT-D-643	Pittsburg Plate Glass Co.
MEK Peroxide		Lucidol Div. Novadel Agene Corp.
Hypodermic Syringes and Needles		Commercially Available

B. For repairs of blisters, delaminations, and scratches, mix polyester resin as follows:

(1) Mix by weight 100 parts of Hetron 92 and 0.50 part of 6% cobalt napthenate. After thoroughly mixing, add by weight 1.0 part of MEK peroxide.

NOTE: MEK peroxide should be added just before using. After mixing, pot life is approximately 1 hour at room temperature.

C. Blisters and delaminations not greater than 1 inch in diameter, not closer than 4 inches, or greater in number than 4 in 4 square feet of surface are to be repaired as follows: (See figure 801)

(1) Drill a small hole into, but not through, skin at each end of blister or delamination.

(2) Fill syringe with polyester resin and pump blister or delamination full of resin.

(3) Press blister or delamination firmly into place and hold until resin has cured.

(4) Remove any excess resin from the surface with light sanding.

(5) Check repair for a sound bond by tapping repaired area with a coin. Any area which is not properly bonded will make a different sound when tapped.

CAUTION: ALWAYS MASK OFF THE MIDDLE 3/8 INCH OF THE LIGHTNING DIVERTER STRIPS BEFORE PAINTING.

(6) Repaint affected area of radome. Refer to Chapter 20.

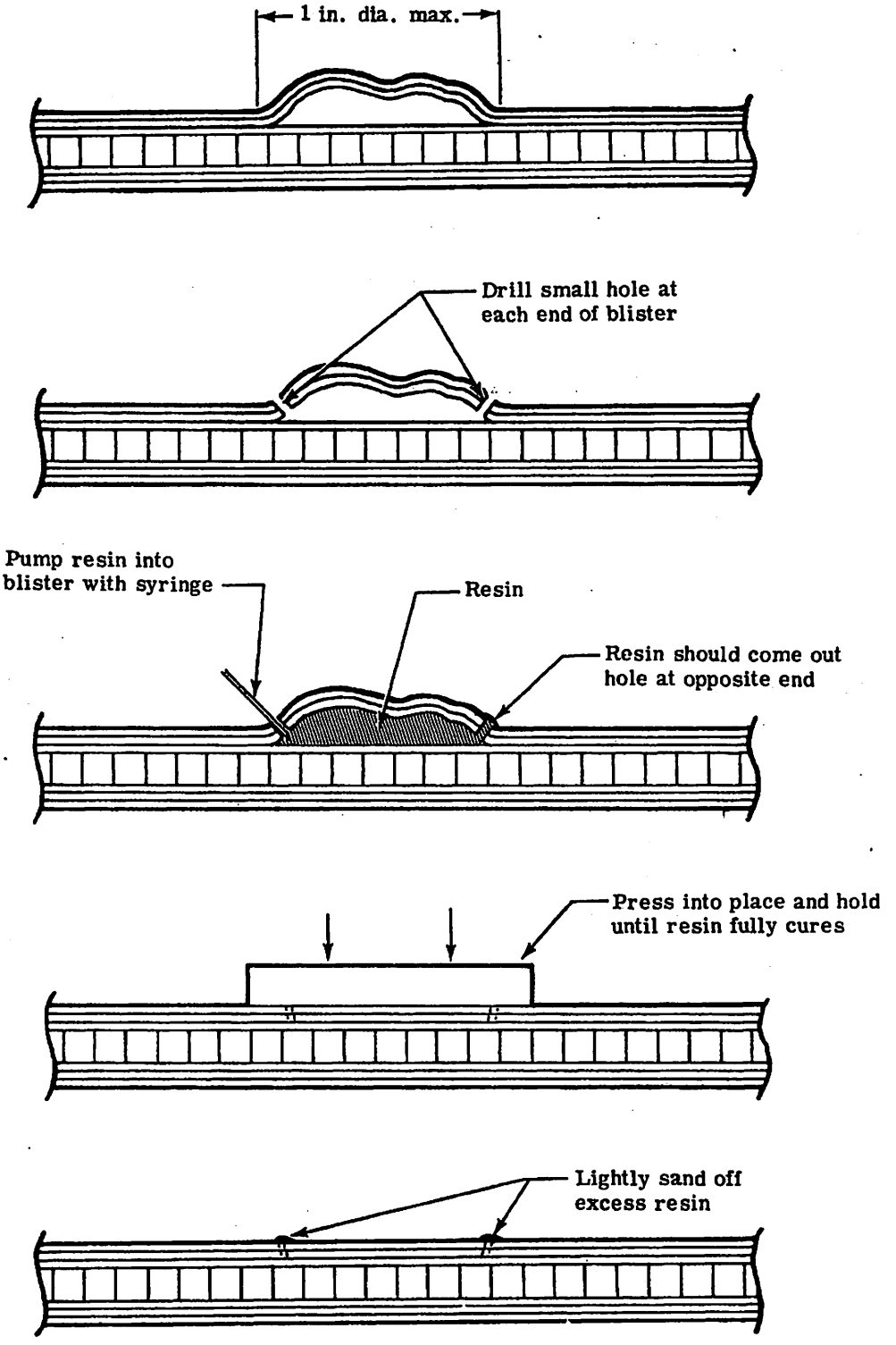
D. Repairable scratches are limited to those not more than 1/8 inch wide, 1/16 inch deep, and 4 inches long. Repairable pits and depressions are limited to those not more than 1/2 inch in diameter and not more than 1/16 deep. These defects must not be any closer than 1 inch and there shall be no more than three defects per 1 square foot of surface area. Repair defects as follows: (See figure 802)

(1) Fill defect with polyester resin and allow to fully cure.

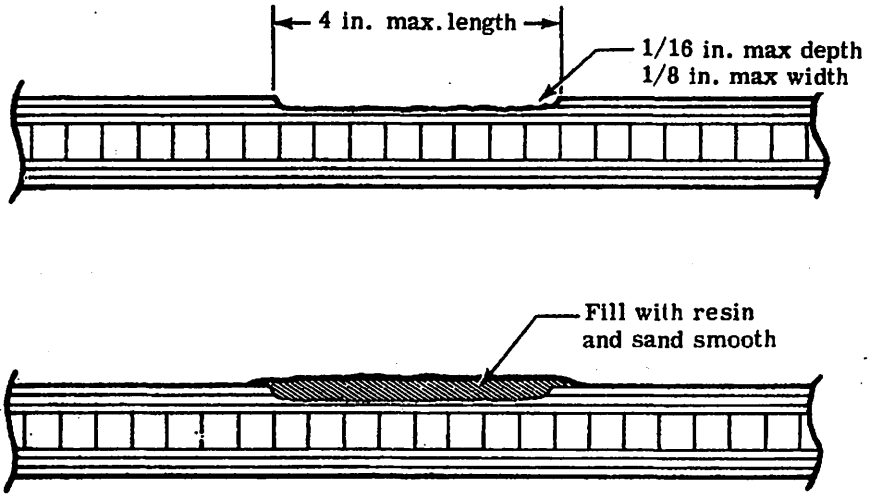
(2) Carefully sand cured resin to a uniform smoothness, blending with radome contour.

CAUTION: ALWAYS MASK OFF THE MIDDLE 3/8 INCH OF THE LIGHTNING DIVERTER STRIPS BEFORE PAINTING.

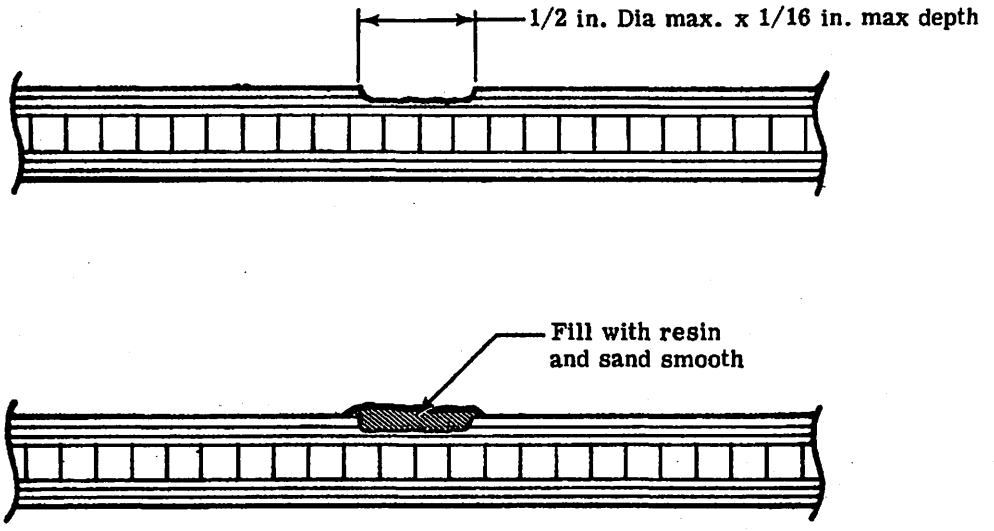
(3) Repaint affected area of radome. Refer to Chapter 20.



Blister and Delamination Repair
Figure 801



Scratch Repair



Pit and Depression Repair

Scratch, Pit and Depression Repair
Figure 802

RADOME EROSION BOOT - MAINTENANCE PRACTICES

1. Removal/Installation

A. Tools and Equipment

NAME	NUMBER	MANUFACTURER
Erosion Boot	5411212-1	Gates Learjet Corp.
Isopropyl Alcohol		Commercially Available
Squeegee - Made of Polyolefin Material		Commercially Available
Methyl-Ethyl-Ketone (MEK)		Commercially Available
Needle, Pin or Sharp, Round, Pointed Instrument		Commercially Available
Rubber Roller		Commercially Available
Clean Cotton Cloth		Commercially Available
Mild Detergent		Commercially Available
Plastic Spray Bottle		Commercially Available

B. Remove Radome Erosion Boot

WARNING: ADHESIVES AND SOLVENTS USED FOR REMOVAL AND INSTALLATION OF THE EROSION BOOT ARE FLAMMABLE AND THEIR FUMES ARE TOXIC. ALL WORK SHOULD BE DONE IN A WELL-VENTILATED AREA AWAY FROM ANY SPARKS OR FLAME.

(1) Remove radome. (Refer to 53-50-01.)
(2) Clean radome along aft edge of erosion boot with MEK. Apply masking tape on radome along edge of erosion boot. This will establish a trim line for new boot.
(3) Apply MEK to aft edge of erosion boot. Allow approximately 2 minutes for adhesive to soften.
(4) Slowly peel erosion boot away from radome while applying MEK along separation line.
(5) After erosion boot has been removed, clean adhesive from radome using a clean cloth and MEK.

NOTE: The longer the erosion boot has been bonded to the radome, the more difficult it will be to remove. It is easier to remove the boot in pieces and then clean the adhesive from the radome.

C. Install Radome Erosion Boot

NOTE: The erosion boot shall only be applied to radomes that have received a black anti-static coating (Refer to Chapter 20.) and that have the lightning diverter strips installed. (Refer to 53-50-03.)

(1) Thoroughly clean radome with mild detergent and water. Thoroughly rinse with clean water and wipe dry using clean cotton cloth or blow dry with clean, filtered, compressed air.
(2) Wipe radome with a clean, cotton cloth moistened with MEK. Do not allow MEK to evaporate completely from surface. Remove MEK by wiping with a clean, dry cloth.
(3) Using a marking pen, place an orientation mark at the forward end in the center of the radome.
(4) Position erosion boot, with protective liner still in place, over radome. Rotate boot to position of best fit.
(5) When optimum fit has been achieved, use a marking pen to trace over the orientation mark previously applied to the radome, placing the same orientation mark on the erosion boot as is on the radome.
(6) Remove boot from radome. Turn boot inside out and place over radome disregarding orientation marks.
(7) In a spray bottle or other suitable container, mix isopropyl alcohol and water in a ratio of from 50/50 to 25/75. Add mild detergent at the rate of one (1) teaspoon per gallon of solution. Mix thoroughly to form wetting agent.
(8) Carefully remove transparent protective liner from boot, saturating exposed adhesive surface of boot with wetting agent as liner is removed.
(9) When protective liner is completely removed, ensure that the entire adhesive surface is completely saturated with wetting agent.
(10) Remove boot from radome. Saturate radome surface where boot is to be installed.
(11) Carefully align orientation mark on boot with orientation mark on radome. Place boot in contact with radome.
(12) Squeegee or roll out wetting solution starting at the orientation marks and working in an expanding circle toward the aft end of the radome. Care should be taken to avoid blisters under the boot.
(13) Blisters (air or wetting agent) appearing after boot application shall be removed by piercing the blister with a needle or other sharp object and working the blister out with a squeegee or a roller.

(14) Using an industrial razor blade, carefully trim the erosion boot at the trim line.

(15) Wipe off any excess wetting solution. Allow boot to set overnight, then re-squeegee or re-roll to assure complete adhesion.

(16) Using an industrial razor blade, cut a hole in erosion boot to match hole in radome for alcohol diffuser.

(17) Install Radome. (Refer to 53-50-01.)

CAUTION: MASK OFF THE MIDDLE 3/8 INCH OF THE LIGHTNING DIVERTER STRIPS.

(18) Paint Radome. (Refer to Chapter 20.)

RADOME LIGHTNING DIVERTER STRIPS - MAINTENANCE PRACTICES

1. Removal/Installation

A. Tools and Equipment

NAME	NUMBER	MANUFACTURER
Lightning Diverter Strips	16180	Dayton Granger Aviation
Mild Detergent		Commercially Available
Clean Cotton Cloth		Commercially Available
Methyl - Ethyl - Ketone (MEK)		Commercially Available
220 Grit Abrasive Paper		Commercially Available
Rubber Roller		Commercially Available
Industrial Oven		Commercially Available

B. Remove Lightning Diverter Strips

WARNING: MATERIALS USED FOR REMOVAL AND INSTALLATION OF THE LIGHTNING DIVERTER STRIPS ARE FLAMMABLE AND THEIR FUMES ARE TOXIC. ALL WORK SHOULD BE DONE IN A WELL-VENTILATED AREA AWAY FROM ANY SPARKS OR FLAME.

(1) Remove radome erosion boot. (Refer to 53-50-02.)
(2) Remove radome. (Refer to 53-50-01.)
(3) Clean radome along edges of lightning diverter strips with MEK. Apply masking tape on radome along edges of lightning diverter strips. This tape will mark replacement area for new lightning diverter strips.
(4) Apply MEK to forward end of each lightning diverter strip. Allow approximately 2 minutes for adhesive to soften.
(5) Slowly lift each lightning diverter strip away from radome while applying MEK between strip and radome.

C. Install Lightning Diverter Strip

(1) Mix a solution of mild detergent and water at the rate of 2 to 3 level teaspoons of detergent per gallon of water.
(2) Scrub area of radome where lightning diverter strip is to be applied. Thoroughly rinse area with clean water. Allow to air dry, wipe dry with clean, cotton cloth, or blow dry with clean shop air.
(3) Wipe washed area with MEK and clean cotton cloth. Do not allow MEK to evaporate completely from surface. Remove MEK by wiping with clean, cotton cloth.

(4) Using 220 grit abrasive paper, scuff-sand the black anti-static coating where each lightning diverter strip is to be applied.

(5) Again clean the radome with MEK and clean, cotton cloth.

(6) Remove protective liner from forward end of each lightning diverter strip. Carefully align strip with edges of the previously applied masking tape.

(7) Press lightning diverter strip into place at forward end. Using a rubber roller and slowly removing remainder of protective covering, proceed to aft end of radome with lightning diverter strip.

CAUTION: DO NOT EXCEED 175° F. RADOME STRUCTURAL DAMAGE MAY RESULT IF TEMPERATURE LIMIT IS EXCEEDED.

(8) When all lightning diverter strips to be replaced are installed, place entire radome assembly in oven at 125° F - 175° F for a minimum of one hour.

(9) About 15 minutes after heat treatment begins, run rubber roller over lightning diverter strip to remove any bubbles which might have formed during heat cure. Repeat this procedure immediately following completion of heat cure.

(10) Install Radome Erosion Boot. (Refer to 53-50-02.)

CAUTION: MASK OFF THE MIDDLE 3/8 INCH OF THE LIGHTNING DIVERTER STRIPS.

(11) Repaint affected area of radome. (Refer to Chapter 20.)

(12) Install radome. (Refer to 53-50-01.) Check continuity between lightning diverter strips and radome installation screws.